

Engineering Management
Field Project

**Electronic Medical Records:
A Case Study to Improve Patient Safety at Royal
Victoria Teaching Hospital**

By

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Executive Summary

Most countries in Europe and the USA are increasingly using an electronic medical record (EMR) system to help improve healthcare quality. Unfortunately, The Gambia government faces a series of health crises including but not limited to HIV/AIDS, malaria, diabetes and tuberculosis. These diseases threaten the lives of thousands of people. Lack of infrastructure and trained, experienced staff are considered important barriers to scaling up treatment for these diseases.

The contribution of this field project outlines the benefits of an EMR system at Royal Victoria Teaching Hospital (RVTH) and how it will improve patient safety. This is a descriptive study using interview questionnaires from officials at the Royal Victoria Teaching Hospital. The study also looks into other facilities in similar developing countries with advanced systems, but not so advanced as to be at the level of state-of-the-art facilities in the U.S.

Results from this study indicates the importance of an EMR system at RVTH to facilitate effective and efficient data collection, data entry, information retrieval and report generation. As a catalyst for development, the implementation of an EMR system at RVTH may make it one on the best hospitals in the West African region.

1. Introduction

According to Dick and Steen, Electronic Medical Record (EMR) is the compilation of patient medical information in a computer-based format that allows the collection, storage, retrieval, and communication of this data. An electronic medical record replicates a paper chart and contains both clinical information (diagnoses, allergies, drug resistance and treatments) and demographic information about a patient; it provides a comprehensive medical picture and can be used by clinicians as a tool to determine appropriate treatment for patients. EMR is not only being welcomed by healthcare providers as a way to improve care delivery but also serves as a catalyst and gold standard for development (Porter, Kohane, & Goldman; Reifsteck, Swanson, & Dallas).

Unfortunately, Africa, a continent faced with many challenges ranging from epidemics, civil wars, and disasters, lacks robust healthcare infrastructure in the form of computerized health care systems. For instance, Ghana has one the best health institutions in the region, Korle-Bu Teaching Hospital. This Hospital, for example, is currently the only institution in the West African sub-region which performs surgery. Due to the quality of outcome, it now receives referrals from most parts of the continent namely the Gambia, Sierra Leone, Liberia, Togo Benin, Tanzania, Nigeria, Cameroon, Cote d'Ivoire, and Ethiopia. Despite its exemplary performance, the hospital has no computerized information system which can help improve care delivery in the region. Therefore, the purpose of this study is to examine the potential benefits of EMR and its ultimate contribution to improving healthcare delivery development in less developed countries like The Gambia.

1.1. Background of Royal Victoria Teaching Hospital

The Gambia is a small country in West Africa, with a population of approximately 1.5 million. RVTH has been in existence for over 100 years in The Gambia's capital, Banjul. It used to be called Royal Victoria Hospital until in the late 1990s, when its name was changed to RVTH. The Gambian Government decided that it had to reduce its dependency on foreign doctors by establishing a medical school in the University of The Gambia (UTG). The UTG now uses RVTH to teach its clinical students. In recent years, The Gambia has been doing much on its own initiative to take to improve the healthcare of the nation.

There are 540 beds in the hospital and the two largest Departments are Pediatrics and Maternity. The biggest "killer" disease in The Gambia is malaria, with young children and pregnant women being particularly vulnerable to this disease. Diabetes, high blood pressure, pneumonia and eye problems such as trachoma and cataracts are also major health problems. The following table provides an estimation of how many patients were seen at RVTH in the year 2008.

Procedure	Number of Patients
Inpatient Admissions	25,281
Children admitted to Pediatrics	9,352
Patients treated in the Eye Center	986
Out-Patient Appointments	over 184,365
Out-Patients in the ER	24,334

Table 1: Number of patients seen at RVTH in 2008

Unfortunately, RVTH does not have any EMR system in place to facilitate patient safety. As noted by participants, “EMR software is not used at RVTH because administration keeps complaining of money. It looks expensive to them and also they are more used to the paper folder”.

Currently, information is very fragmented and therefore does very little to help patient safety and consistency in care. Another important issue here is that a large number of these patients are illiterates. To ensure they receive the appropriate treatment, they will have to explain to the physician current medications they are taking etc. This can be a very challenging and fatal to the patient sometimes.

The typical paper medical record contains sections including information on demographics, admissions, discharge summaries, progress notes, protocols, laboratory results, radiology results, surgical and pathology reports, orders for, treatment and nursing notes. Most documentation regarding treatment of a patient is written directly in the patient's medical chart.

On a given day a patient arrives at the hospital for care, sign in his name and waits anywhere from 30 minutes to six hours to get their records pulled depending on the day. Physicians, nurses, medical residents who need access the information in the medical record must wait till it's available. Typically, medical records are transported to the outpatient clinic where the patient would be seen, and then returned to storage center to be filed again. It is necessary for the medical record to follow the patient throughout their visit. If the patient was seen in one clinic where orders were written, it was necessary to physically transport the record when the patient moved to the medicine room for treatment.

The purpose of this field project is to examine the potential benefits of an EMR system and its ultimate contribution to improving patient safety at the Royal Victoria Teaching Hospital in The Gambia.

2. Literature Review

The first generation of EMRs was extensions of medical billing systems in large US hospitals. Over the last four decades, they have been used as tools to organize and store medical data. EMRs are widely accepted as important tools to support high quality health care in the US, Europe and other developed countries. Evidence shows that using EMRs that include decision support systems improves quality of care and both reduce medical errors and unnecessary medical investigations (Partners in Health).

Experience with the use of EMRs in developing countries, if available, is much more limited than it is in the US and Europe. Now there is considerable interest in using medical information systems to support the treatment of HIV and TB in Africa, Latin America, and Asia.

In most African countries, healthcare information systems have been driven mainly by the need to report aggregate statistics for government or funding agencies. Such data collection can be performed with simple paper forms at the clinic level, with all electronic data entry done centrally, but that approach tends to be difficult and time-consuming and may provide little or no feedback to the staff collecting data. Individual patient data that are collected and accessible at the point of care can support clinical management. Clinicians can easily access previous records, and simple tools can be incorporated to warn of potential problems such as incompatible drugs. Physicians or nurses can check on the outcomes of individuals or groups of patients and perform research studies. Many of these functions will work well on paper or with simple spreadsheets for up to 100 patients but become very time-consuming and potentially unreliable with more than 1,000 records, and virtually impossible with 10,000 or more.

Experience with the use of EMRs in developing countries is much more limited than it is in the US and Europe, but there is now considerable interest in using medical information systems to support the treatment of HIV and TB in Africa. Some examples of EMR use in Africa include:

- The Regenstrief Institute in collaboration with Moi University in Kenya developed an EMR for general patient visits to clinics in western Kenya. This system was subsequently modified to support the care of several thousand HIV patients.
- Baobab Health Partnership in Malawi has developed an EMR system using innovative, low-power touch-screen PCs for data entry and display. This system is now used to support the care of more than 7,000 HIV patients in the Lighthouse clinic in Lilongwe and has been chosen by the national HIV program for use throughout the country.
- Careware®, an HIV medical information system developed for US patients, has now been deployed in Uganda and is planned for use in other African countries and in Latin America. (Partners In Health)

A wide-ranging literature review of electronic medical record implementation over the past decade reveals that clinical, workflow, administrative, and revenue enhancement benefits of the EMR outweigh barriers and challenges. Among other key efforts, organizations must train and motivate users to navigate EMR systems, as well as develop a common structured language. Clinicians who used CPRs found that electronic

access to clinical information saves time and provides a thorough and efficient way to manage patient information

To reap the full benefits of an EMR, organizations must redesign current workflows and practices to evolve into efficient providers of care. EMR systems are developed to meet the following goals: improve quality of care, reduce organizational expense, and produce a data stream for electronic billing. (Dassenko and Slowinski). The EMR meets these goals through workflow automation, connectivity, and data mining. (Gaillour)

The Computer-based Patient Record Institute's (CPRI) definition concurred with the other researchers, but added that the EMR provides protection of patient and provider confidentiality, has a defined vocabulary and standardized coding, produces documentation as a by-product of patient care, connects local and remote systems and provides electronic support for secondary users (payers, policymakers, researchers). (Fromberg and Amatayakul)

Unfortunately, most EMR systems are unable to offer all of the components defined by the CPRI because “the technology is too complex and too expensive, doctors won’t use computers, and standards don’t exist.”(Gaillour)

The advantages associated with implementing EMRs are well documented and are straightforward. The difficulty comes with placing a dollar figure to these advantages; consequently, few organizations have published studies describing the actual costs and benefits attained from implementing EMRs. (Bingham) The benefits associated with CPRs are organized into four categories: clinical, workflow, administrative, and revenue enhancement. Renner, states that measuring all the benefits associated with EMRs is

virtually impossible, and that it is probably safe to select those that can make the greatest financial difference, and incorporate them into a financial model.

Clinical benefits seen after implementing an EMR include: better access to the chart, improved clinical decision making and disease management, enhanced documentation, simplified patient education, and increased free time to spend with patients, accompanied by improved perception of care and quality of work life. These benefits ultimately result in better delivery of patient care and safety.

Despite all of these benefits, EMRs are not a standard in today's healthcare systems. It is evident that EMR technology is still a hot topic for discussion when browsing through current healthcare technology and management journals. The following barriers have kept healthcare leaders discussing EMR technology instead of adopting it: cost, leadership, ROI, vendors keeping up with users' needs, and deficits in the following categories: public policy, standards, security, and a true definition.

First of all, cost has kept organizations from implementing EMR systems. These costs can be organized into the following categories: software, hardware, infrastructure development and maintenance, implementation, education, planning, and administration. Software costs include development or purchase, maintenance, and upgrades over time, while hardware costs include purchase of workstations. (Mohr) Infrastructure development and maintenance costs include servers, interfaces, workstations, network cables, network maintenance, and help desk operations. Planning costs include development of an implementation plan, identifying measurable outcomes, and choosing meaningful metrics and goals, while implementation costs include training, overtime

associated with entering patient data, business disruption during transition, employee resistance to change, and lost productivity.

Drazen, suggested that leadership was probably a more significant barrier than cost because, in the past, healthcare leaders have raised capital for essential business initiatives such as major building programs, acquiring a physician network, or starting up a managed care organization. This amount of capital is on the same scale as an EMR. Next, Drazen stated that a lack of government support is a major issue holding up EMR implementation. Unfortunately, the federal government does not contribute financially to EMR implementation projects.

Without standards and structured data definitions, computer systems are not guaranteed to interface easily with each other, and databases are not easily developed. Most individual departments within a healthcare system have already invested in computerized patient information systems; however, these systems are isolated and do not communicate well with one another. Getting these systems to interface is one challenge facing EMRs.

Data security continues to be an ongoing challenge. Bergman, found that politicians, consumer advocates, and the general public have voiced concerns about risks to the privacy and confidentiality of patient information. However, when compared with the security of the paper chart, the EMR's electronic audit trails and passwords actually improves internal security. The EMR may be more secure for internal breeches of confidentiality, but must also be protected from external breeches such as hackers, who could potentially enter the EMR from an off-site location and download volumes of

confidential information. Firewalls and encryption software are methods used to protect patient data from these violators.

Clinicians who use EMRs recognize two benefits: First, electronic access to clinical information saves time. Second, electronic access provides a thorough and efficient way to manage patient information. With EMR systems, comprehensive information can be located and presented in a way that is relevant to the task at hand. (Dassengko and Slowinski)

The obstacles identified have thus far been insurmountable, but the considerable achievements identified in the benefits section of this discussion suggest that the advantages are well worth the effort. As Lenhart et al state, "Success comes at the price of considerable effort, persistence and optimism, as well as dedicated leadership." (p. 114) some organizations that invested in early EMR systems are struggling to show the qualitative benefits promised by vendors because an electronic version of current work processes is not cost effective. (Sandrick) "If the ROI were a function of the information tool itself, the financial benefits would be experienced universally." (ROI: The White Paper. A Business Case for Electronic Medical Records)

To get the most value out of an EMR, healthcare organizations must reengineer the following work processes to make full use of the system: Healthcare organizations must first train and motivate their users on how to navigate and operate the EMR tools. To optimally use the EMR, it must be implemented from registration through billing, thus allowing the organization to realize full potential benefits across the delivery system. These benefits include clear, concise, and comprehensive documentation, greater efficiency, care consistent with best practice guidelines and improved claims processing.

It is difficult to measure the economic value associated with less tangible benefits such as higher quality of care, patient service, provider and employee satisfaction, and competitive advantage. It is even more difficult to allocate necessary resources and commit to institutional change when the paper chart is “getting the job done,” even if it is not in the most efficient style. However, Carlon, suggests that all providers should embrace the EMR to deliver safe medical care. The information in the EMR can reduce medical errors to avoid dangerous, sometimes lethal, mistakes. If organizations can’t show that EMRs have a positive ROI, they may decide that the EMR is just another expense of running a business. The expense is to improve patient safety and reduce medical errors. This review of literature emphasizes that the use of EMR systems contributes to the ultimate goal of delivering effective care while improving patient safety.

3. Procedure and Methodology

The study is an exploratory study conducted in Banjul, The Gambia, to examine the potential benefits of EMR and its contribution to improving patient safety. For the most part, this study is descriptive and categorized as a non-experimental qualitative study. Initial contacts were made with the Chief Medical Director, Development Officer and the Head of Medical Records at the RVTH to solicit participants for the study.

3.1. Experimental Design

Survey approach was used to gather data from healthcare professionals who are considered potential users of EMR. Copies of the questionnaires were sent through e-mail to participants. A total of 50 surveys containing 15 questions were sent out and 30 of them were returned.

The content of the survey designed was open-ended questions based on the following areas: knowledge of EMR, benefits and challenges of EMR, transition from paper-based system to EMR, security issues associated with EMR use and assistance given to developing countries by developed nations to implement or use EMR. Other areas include, demographic details of respondents based on profession, length of practice, age and sex. The survey questions can be found in the Appendix.

Participants were selected based on their level of healthcare training. The population set for the study was healthcare professionals from the RVTH, which includes physician consultants, surgeons, pharmacists, nurses, midwives, pathologists, radiologists, and laboratory technicians. Study participants were limited to these previously mentioned health professionals, since they would be the principle users of an EMR system.

RVTH has a total population of about 500 professionals and a sample size of 50 was chosen for the study. Since this was the first time such a study was being conducted in the country, there was limited knowledge of professionals on the subject as well as difficulty in getting volunteers to participate.

3.2. Survey Procedure

Survey questionnaires were converted into a PDF file and mailed electronically to all 50 participants on February 2, 2009. Unfortunately, five medical professionals who were initially contacted to participate in the study later declined to take part due to lack of understanding of the survey questions. As a result, different participants were contacted to replace the five individuals to make up the sample size. Since the researcher could not travel to Gambia to facilitate the survey, one of the administrative officers at the hospital was contacted and helped to distribute hard copies of the questionnaire to all participants.

Participants were requested to fill out the attached survey and return it in a sealed envelope to this person or the chief administrator. After three weeks, on February 23, 2009, a first reminder was mailed asking for their cooperation and the importance of returning the survey. A final reminder was sent out on March 9, 2009, to those who might have forgotten to return the survey.

3.3. Data Analysis

The 30 completed surveys were coded, sorted, and organized into themes. A spreadsheet was created in MS-Excel to enter all data for analysis. All responses were placed into themes and summarized. The survey responses and themes generated were used to determine result interpretation, recommendation, and future research direction.

Despite initial difficulties to get volunteers to participate in the study, 30 out of the 50 surveys mailed were returned on March 16, 2009, thus representing 60% response rate.

3.4. Limitations of the study

Due to the difficulty of getting other hospitals in the area involved, the study was limited to RVTH only. The findings represent views of that hospital alone. However, the research would have been more interesting and challenging if more professionals from other hospitals were involved in the study. Secondly, due to cost of air travel between the United States and Gambia, the researcher was not able to travel to Gambia to collect the necessary data for the study. The inability of participants to respond to some important questions on the survey skewed the data.

Finally, due to the six hour time difference between Kansas and Gambia, it was hard to reach the participants at during business hours. Lack of high speed internet or sometimes no connection at all caused the delay in receiving all the responses on time. It was also really difficult to get people to cooperate because the survey was not on their list of priorities.

4. Results

Based on the methodology, surveys were mailed to 50 participants at the RVTH in Banjul, The Gambia. Thirty completed surveys were received which included 15 questions. The results from all participants are as follows:

The 30 respondents consisted of 17 males, 11 females and two people who did not indicate their gender. The age range of the group was 25–56. Table 2 presents the professional distribution of participants. No Response represents people who did not include their profession. The five students, however, included final year medical and dentistry students, as well as nursing, and medical laboratory students. Professional experience ranged between 1 and 20 years.

Profession	Number
Surgeon	3
Pharmacist	2
Physician	3
Radiologist	2
Midwife	5
Nurse	6
Laboratory Technician	2
Student	5
No Response	2
Total	30

Table 2: List of Professionals, RVTH 2009

To analyze this result, key words such as computerized, storage and retrieval, were used to determine respondents' understanding of the concept of an EMR system. Subsequently, one-third of respondents (33.3%) who included these three key words were marked as right. While nine people representing 20% who said it is a mechanism for storing patient medical record on a computer were classified as partially right and approximately half respondents (46.7%) who just said the use of machine to keep patient medical data were classified as having an idea or understanding of the system.

In addition, implementing and running a successful EMR system requires a number of key elements. Accordingly, 15 people identified technical elements such as (electricity, hardware, software, etc.), 10 stated patient data, while four said adequate trained personnel, and one person indicated the need for money to train staff on EMR. Also availability of adequate infrastructure such as experts to support and train care providers on EMR is very crucial when implementing EMR system. However, more than half respondents agreed that enough infrastructures are not available in Gambia to support EMR implementation. On the other hand, 10 people believed that infrastructures are available, while four said available infrastructures are only few. Despite unavailability of infrastructures, 16 respondents reported there are enough computer experts in Gambia to train healthcare providers to use EMR. Seven reported experts are not available; six stated experts are available but too few to meet the demand and needed training requirement of the healthcare sector. Lastly, one person indicated he has no idea of the subject.

Responses concerning how much developed nations are assisting less developed countries like Gambia with Health Information Management (HIM) system infrastructure

implementation showed diverse opinions. Nine people said developed countries are helping, 15 responded no. However, six indicated that “the help given from developed nations are not enough and sometimes electronic devices sent to less developed countries like the Gambia are inferior and lack quality”. Still others think “some form of assistance comes in to support the country on information management systems but not much is channeled towards the health sector”. Lastly, seven people reported they have no idea “if developed nations are helping” and one person did not respond to this question at all. This pie chart below shows the sources of funding and the amounts received for the year 2008.

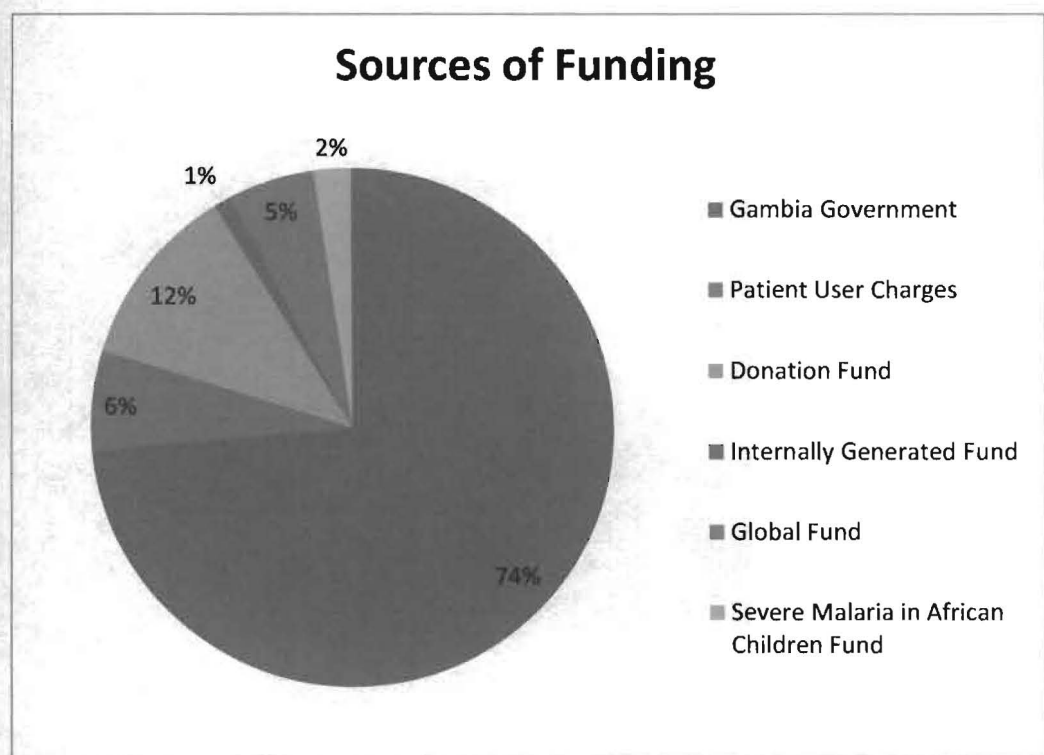


Figure 1: Sources of funding, RVTH 2008

The majority of funds come from the Gambia Government in the form of subvention received monthly or quarterly in advance. However, about 70% of the amount goes towards payment of salaries and allowances to approximately 1,200 staff. Other donations received are in the form of drugs, equipment, supplies and services which made considerable contribution to the hospital. (RVTH)

4.1. Reasons why EMR is not being used at RVTH

Paper records are bulky and can take up costly space. Filing, retrieval of files, and the re-filing of paper records are very labor-intensive methods with which to store patient information. Plus if a record is checked out for one department, another department cannot access the chart. The impact of not having immediate access to key information in emergency situations can be serious. Paper medical charts also cannot be effectively searched and used to track, analyze, and/or chart voluminous clinical medical information and processes. They cannot be easily copied or saved off-site. Also physician's orders and the corresponding results such as medications and labs can be issued and saved in a comprehensive EMR system. Our literature review and results have proven that paper records are costly, cumbersome, misinterpreted, easily misplaced and cannot be used for any meaningful decision analysis.

Unfortunately, RVTH does not have any EMR system in place to improve patient safety. As noted by participants, "EMR software is not used at RVTH because administration keeps complaining of the lack of money. It looks expensive to them and also they are more used to the paper folder". Nevertheless, four key issues were identified by participants as the main reasons why RVTH does not have an EMR system in use.

Overall, 36% of respondents attributed the problem to lack of resources in terms of personnel and infrastructure, 29% blamed it on lack of leadership initiative and priority. While 18% reported cost in terms of equipment and training personnel, 15%, however, stated lack of EMR importance or awareness and fear to change. Lastly, 2% respondents did not give any reason.

4.2. Benefits and challenges of EMR

There are both benefits and challenges to EMRs. Many argue that positive aspects of using an EMR system outweigh the challenges. Even though the investments in EMR systems are costly, most argue that over time this outset cost will result in greater savings.

As well as cost saving, many agree that one advantage of EMR system is that they save space. Instead of keeping huge paper files on patients, all records are kept on computer files. Though someone must store these records in computers, this still represents a small percentage of the space required to store physical records. Along with saved space is reduction of paper used by hospitals. Although EMR systems do not render paper obsolete, but they certainly do reduce needed paper significantly.

Another advantage of electronic medical records is the ability for all in a health care team to coordinate care in terms of monitoring and treating diseases. This helps avoid duplication of testing, prescribing medicines that in combination might be dangerous and the ability for anyone on the medical team to understand the approaches taken to a condition. A person with complex health issues may see several specialists, and can easily become confused by overlapping or contrary advice. When specialists and primary care doctors use the same system for electronic medical records, then everyone

on the team would be aware of all the other team members' actions and recommendations.

Electronic medical records may save time as well. Though faxing and email may assist one doctor to get information from another doctor or a laboratory, there is generally a wait time to receive this information. When a doctor has instant access to all of a patient's information, including things like x-rays, lab tests, and information about prescriptions or allergies, he or she is ready to act right away, thus saving time. This may be particularly helpful in emergency situations where a patient cannot answer questions about medical history or allergies due to extreme illness or injury.

Generally, doctors are often considered to have the worst handwriting, though this is just a generalization, unclear writing can lead to misinterpretations and mistakes. Typed notes and prescriptions are more legible and less likely to create misunderstandings. However, electronic medical records do not rule out the occasional typo.

One of the main disadvantages to EMR system is that start up costs is enormous. Not only must you buy equipment to record and store patient charts (much more expensive than paper and file cabinets), but efforts must be taken to convert all charts to electronic form. Patients may be in the transitional stage where old records haven't yet been converted and doctors don't always know this. Further, training on EMR software adds additional expense in paying people to take training, and in paying trainers to teach practitioners.

In fact, one concern about the use of electronic medical records is that doctors may have a significant learning curve when these programs are first implemented. A poor

typist may actually take a long time to input information. Doctors often have to be their own medical clerks especially during an office visit, and a doctor distracted by confusing technology may not be as alert to a patient's symptoms or needs.

There is no single electronic medical records source or system, so different hospitals and individual clinicians may not all be using the same program. This negates the possibility of instant information for all on the medical team, since one program may not communicate with another.

Another concern is that electronic medical record systems might be hacked and exploited by others. Since one of the first considerations of medical treatment is confidentiality, it may remain a concern about how many people may have access to other medical records which they are not authorized to do so. Misuse of private medical information could create problems for people who have conditions they wish to keep private.

Despite these concerns, it appears many hospitals are now attempting to use EMR systems. It remains unclear how long it will take for hospitals to transition completely from the traditional paper-based systems to a complete paperless environment.

As shown from the survey results, it is clear that many participants believe that implementation of EMR will tremendously improve upon patient in the country. For instance, as noted by one respondent, "availability of patient past history in electronic format will enable health care workers have information about patients in seconds and with ease which will facilitate quick diagnosis and treatment hence reducing the rate of mortality.

There is always some level of fear and resistance to change, especially in the healthcare industry. A question concerning the level of acceptability from the traditional paper-based system to EMR system shows that such change will be met with some difficulties.

More than half of respondents said the process would be challenging initially, but eventually care providers will accept the system because it will improve patient safety and work performance. Although the majority may still prefer the paper-based system, “they will change when they see the importance or need for EMR” stated a participant. Others also believe it would be a “welcome idea”.

The adequate protection of patient health record requires limitations at all levels, such as: collection, use, access, and disclosure. Therefore, development of privacy, confidentiality, and security principles is necessary to protect patients’ interests against inappropriate access to their health data. Unfortunately, 14 respondents (47%) did not respond to this important question regarding measures necessary to maintain patients’ privacy, security, and confidentiality at RVTH. However, 16 people representing (53%), did state that all health records must be securely protected by use of password, data encryption, and access restrictions to users.

It is obvious from the survey results that effective implementation and utilization of EMR can improve patient safety in developing countries. Considering training as one of the key elements to EMR success, a question was asked to determine length of time required to train care providers in Gambia on EMR. Almost 50% of respondents indicated it might take 6–18 months depending on “practitioners’ ability to understand the concepts of EMR as well as the user friendliness of the software”. Others believe “for

current medical students who are already computer literate may take about two weeks, but the older practitioners will take longer time (approximately over a year)". Table 3, below shows the number of respondents that own a computer or has had some form of computer training in the past.

Profession	Own a Computer	Computer Training	
		Yes	No
Surgeon (n=3)	1	1	2
Pharmacist (n=2)	1	1	1
Physician (n=3)	1	1	2
Radiologist (n=4)	0	0	2
Midwife (n=5)	1	2	3
Nurse (n=6)	2	3	3
Laboratory Technician (n=2)	1	1	1
Student (n=7)	2	7	0
Total (n=30)	9	16	14

Table 3: Computer ownership and previous computer training received by the respondents at RVTH

Sixteen respondents (53%) had received some form of computer training in the past, while the remaining 14 (47%) had no training. Only nine respondents (30%) owned a computer while the remaining 21 (70%) never owned a computer.

An EMR system has many components and functions. Participants were asked to rate on a scale of 1–10, six different functions of EMR systems according to the order of

relevance to their work. Eighteen participants (60%) rated the functions correctly, nine representing 30% rated it wrongly, and three participants (10%) did not respond at all.

Figure 2 shows the averages of the corrected ratings by the 18 participants in relevance to their work.

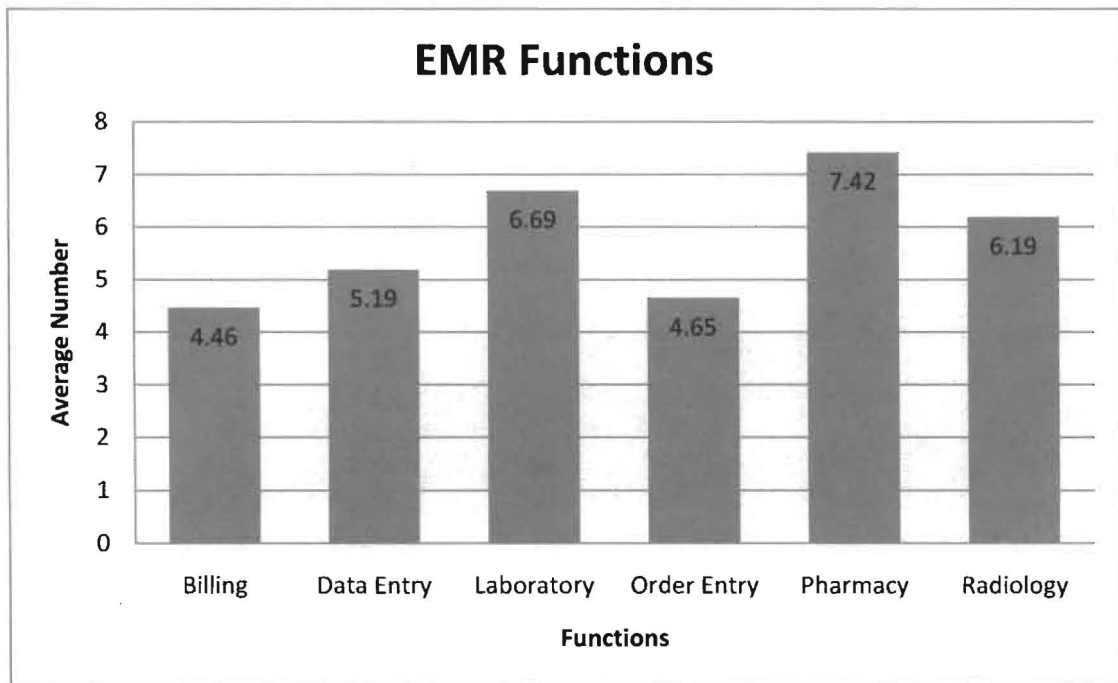


Figure 2: Averages of EMR functions in order of relevance to work at RVTH

The illustration from the figure above shows that EMR is more relevant at the pharmacy according to the respondents. This goes further to emphasize the point that EMR are useful when prescribing a medication for a patient. The prescription will be legible, interactions and allergy information will be displayed, thus improve patient safety. In this regard, fatal situations such as dispensing the wrong medication to a patient may be avoided.

5. Summary

The study focuses on the role of EMR in improving patient safety. Using survey methodology developed thirty responses from participants at the Royal Victoria Teaching Hospital in Banjul, The Gambia was analyzed about the benefits of EMR and how it may contribute to improving patient safety. Results from the research indicate strong importance of EMR system in RVTH to facilitate effective and efficient data collection, data entry, information retrieval, report generation, and research. It also indicates that the use of decision support tools like computerized physician order entry (CPOE) will help in medical errors reduction, improve healthcare planning, decision-making, and disease management in the country (Fraser et al., 2005).

6. Conclusion

The potential of EMR system to improve patient safety has been recognized over the past decade to enhance healthcare delivery and facilitate decision-making process.

Subsequently, EMR and other clinical decision support system tools are currently used in both primary and secondary healthcare facilities in most developed nations. However, implementing an EMR system at RVTH may be a daunting task. It requires good planning, strong management, physician leadership and supportive staff.

The most immediate benefits of EMR system include accurate medication lists, legible notes and prescriptions, immediate available charts, decreased chart pulls, lower transcription costs, medical errors reduction, and improved quality care and standard in patient safety. Unfortunately, most countries in sub-Saharan Africa and other poor

nations lack the experts, funding and infrastructure necessary for the implementation of such modern healthcare technology to ensure continuity of care.

Automating the paper-based health record system at RVTH can have a lot of importance for practitioners, patients, administrators and managers. I hope this study will serve as a baseline for funding organizations to help health information officers explore and collaborate with the RVTH to design and implement the first EMR system in Gambia.

7. Suggestions for Additional Work

Due to absence of legislative body such as HIPAA, in the Gambia to enforce regulations against breach of privacy, confidentiality, and security of electronic patient record, findings indicate “passage of laws to back the implementation of the system”.

However, in spite of the importance of security, it is essential that the appropriate people are able to access information when needed. Goedert explains how a medical center in Washington created a virtual private network (VPN) to secure data sent within the facility and other external sources. However, too many VPN's were created and the network became too secure, which caused appropriate users to have to go through many authentication procedures before they could log into various applications. Physicians were not able to do two tasks at once during a single session. To resolve this problem, they had to bring in a vendor to modify the security settings.

Considering the poor source of reliable electricity supply in the Gambia, more than half of the respondents suggested constant electricity supply is the most important thing to take into account when implementing EMR due to the inability of the hospital's standby generator to kick in immediately during power outage. This was the most interesting result, because the assumption was that the electric supply is now stable in the Gambia. Some responses that were expected to were hardware selection and installation, software configuration, space, security and dealing with paper record. In spite of this problem, study results revealed that developed nations are not doing enough to help developing countries implement modern technology necessary to improve patient safety.

Research indicates that Information Technology (IT) is contributing to improved efficiency of health service deliveries in the first world. At the same time, many scholars believe one possible area of IT intervention in the health domain is the automation of medical record system. Due to medical knowledge explosion, appropriate decision-making and plan demands accurate, timely, relevant and appropriately formatted information. Unfortunately, most countries like Gambia and other poor nations in sub-Saharan Africa lack IT infrastructure, fund and experts to facilitate modern healthcare delivery. Therefore, to achieve the adoption of EMR systems, it is necessary that international organizations and governments must assist poor countries with funds, develop their human capacity and work effectively with the local experts to design and implement information systems that will strengthen these countries' health systems performance.

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Glossary

Acronym	Meaning
AIDS	Acquired Immune Deficiency Syndrome
CPOE	Computerized Provider Order Entry
CPR	Computer-based Patient Record
CPRI	Computer-based Patient Record Institute
EMR	Electronic Medical Record
HIM	Health Information Management
HIPAA	Health Information Portability and Accountability Act
HIV	Human Immunodeficiency Virus
IT	Information Technology
ROI	Return On Investment
RVTH	Royal Victoria Teaching Hospital
TB	Tuberculosis
UTG	University of The Gambia
VPN	Virtual Private Network

Appendix

EMR survey at RVTH

1. What is your main profession?
2. How long have you been practicing at RVTH?
3. Age and Sex.
4. What is your understanding of electronic medical record (EMR)?
5. What are the things needed to implement EMR?
6. Are there enough infrastructures in Gambia to support EMR implementation?
7. Are there available information and communications technology experts to train care providers on EMR?
8. In your opinion, how much are developed nations helping less developed countries to implement EMR?
9. What are the reasons why EMR software is not being used at Royal Victoria Teaching Hospital?
10. Do you own a computer?
11. Have you previously had any computer training?
12. Identify some ways by which EMR can contribute to patient safety in Gambia?
13. How quickly do you think care providers can be trained to use EMR and to what extent will they accept the process of change?
14. What would be the ideal approach necessary in Ghana to maintain patient's security, privacy and confidentiality?
15. On a scale of 1 to 10, with 10 being the highest, rate the following functions of EMR based on the order of importance to your work.

EMR FUNCTIONS	RATE
Billing	
Data Entry ((Patient demography, appointments schedules etc.)	
Laboratory (Lap tests)	
Order Entry	
Pharmacy (Prescriptions, etc.)	
Radiology (X-ray results, Images, etc.)	